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International Fisheries Exhibition
LONDON, 1883

NOTES
ON THE /3
FISH SUPPLY OF NORWAY

BY
FREDRIK M.eltzer WALLEM
EXECUTIVE COMMISSIONER FOR NORWAY TO THE INTERNATIONAL
FISHERIES EXHIBITION, LONDON

LONDON
WILLIAM CLOWES AND SONS, LIMITED
INTERNATIONAL FISHERIES EXHIBITION
AND 13 CHARING CROSS, S.W.
1883

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International Fisheries Exhibition.

LONDON, 1883.

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CONFERENCE ON THURSDAY, JULY 5TH, 1883.

LORD EDMUND FITZMAURICE, M.P., in the Chair.

NOTES ON THE FISH SUPPLY OF NORWAY.

ON a map in the Official Catalogue, called "The Fisheries Map of the British Islands," you will find a dotted line somewhere between Scotland and Norway. It proceeds from the ocean west of Ireland round the north of Scotland, crosses the North Sea and follows the south-eastern coast of Norway, and then turns back along the whole Norwegian coast. The line is only called "the 100-fathom line"! You may think the line should indicate the limits of the British fisheries, but that is not so; it only tells you where the water is 100 fathoms deep, and that the ocean at the north-eastern part of the North Sea, or off the Norwegian coast, is in some places still deeper; it has the shape of a narrow, long basin.

A closer investigation of depth would show, that similar basins extend in some places about one hundred miles into the country in Norway,* forming, in connection with

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* The longest basins or fjords on the West coast of Norway are:—

Hardangerfjord	100	kilometres	long.
Sognefjord	145	,,	,,
Nordfjord	70	,,	,,
Trondhjemsfjord	135	,,	,,

Sognefjord is as well the longest as the deepest one, being about 690 fathoms deep.

the basin in the ocean, a set of warm water-belts, which keep the temperature in the sea as well as on shore very moderate, while ice covers land and sea almost everywhere else at the same geographical latitude; for instance, in Greenland and Siberia.

These warm-water basins in the Norwegian Ocean are of the greatest importance for the fauna and flora, for the life in the ocean as well as for the life on shore. In the basins live the large schools of cod and herring, and you may call them "the large feeding-ponds," in which the food from the western and northern parts of the Atlantic Ocean settles down, and where an abundance of all kinds of fish come together to find food and feed upon each other.

The Norwegian fisheries are not carried on here or from the surface of these basins. Very few fishing vessels go out to "the feeding ponds" or grounds to fish. Only when the cod, herring, caplin, and mackerel leave the deep water and go to the eastern edges of the basin to find suitable spawning places close to the shore in the dark winter time or the early spring, only then the schools will come within the limits of the Norwegian fishing places.

As the fisheries, especially that of cod and that of winter herring, are carried on in the spawning season and when the water is moderately cold, the schools coming in from the ocean are compact and enormous. The fishermen wait until the schools come close up to their stations, and they are here able to catch large quantities from their small open boats, quantities that would be many times multiplied if the stormy days of winter did not interfere, in fact, so much that only half of the season can be used for fishing.

These winter fisheries, on the spawning-grounds of the cod and the herring have been carried on, certainly as far back as the history of Norway reaches, and that is more than a thousand years. We find that in olden times those parts of Norway were the richest and strongest, where the fisheries were most successful or easiest. The largest city in Norway, and in some respects the largest business place of Northern Europe, was that port, from which the largest quantities of fish-products were exported from Norway to Southern Europe. And only within the last fifty years, during which other industries have developed rapidly in Norway, and have grown larger than the fisheries, has the central station of business and industry of Norway been removed to another part of the country. But still the fisheries of Norway are of such importance for the country, that without them the population would fall perhaps 30 per cent., and large parts of the coast would have no inhabitants at all. More than 40 per cent, of Norway's exports are fish products.*

As, I suppose, it would be proper from this international platform to look upon the question of fisheries also as an international one, especially with regard to the fish supply of the world, or, in the present case, perhaps more distinctly with regard to the fish supply from the ocean and fishing grounds of the North Sea, I shall make a few remarks on this subject, without entering into a description of fishing, gears, boats, etc.

The most important fisheries in Norway are that of cod and herring; and, as I mentioned before, the main fisheries are carried on in the spawning season, and on the

---

	Millions Kroners.
* The export from Norway in 1881 was in all .	120·9
Fish products	50·2
Timber and wood	44·9
The balance	25·8

very grounds where the fish spawns; some places even not farther from the huts of the fishermen than they can see the schools arriving followed by whales and birds.

THE CODFISHERIES.

We can trace the large cod fishery of Lofoten as far back as a thousand years, although we cannot say how large it was in olden time. In these thousand years there has never been any fear that the enormous takes of spawning fishes should have any bad effect upon the schools. The places where the fishery is carried on are exclusively spawning places; scarcely any schools at all are to be found there during the rest of the year. The codfish, which come in from the deep basin from January to April, are mostly every one of the uniform size of 10 or 11 lbs. weight alive,* and their errand seems only to be that of a first spawning-trip. The character of the coast, the vegetation of the sea around the islands is a most charming one for a codfish—and it would be difficult to find a more comfortable bed and home for the small codlings than the coast of Lofoten and other spawning-places of Norway. The "climate" of the sea here must be very pleasant for all fishes, coming on purpose for spawning. The water is moderate all the year; no ice in the winter, no "dangerous" heat in summer, and besides

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* The weight and length of the codfish at Lofoten have been taken only lately; the returns for the year 1882, the average fish being not fat at all that year, show the following figures as average of about 200 fishes.

	Cod Caught by Long Line.		Cod Caught by Gill-net.	
Length . . .	83·0	centimetres.	87·0	centimetres.
Weight, round .	4·71	kilograms.	5·17	kilograms.
„ split . .	2·59	„	3·00	„
The liver . . .	0·17	„	0·21	„
The roe . . .	0·35	„	0·50	„

that there is a slow gradual change of temperature from the surface to the bottom of the sea, to give the fish a chance to find the most suitable temperature for the time. In winter, when the temperature of the air may be 10 to 12 degrees below freezing point, the water would be quite warm and comfortable (for a cod), and in summer, when the air and even the surface of the water is too hot for a fish, the water in the deep basins would be just as cold and pleasant as desirable for the schools of cod and herring.

The following tables from the official returns will show the difference between the temperature of the air and that of the sea; also how small the changes of the temperature of the sea are during a year :—

In the Week ending		The Temperature of the Air, 1881. Centigrades at Svolvær.				The Temperature of the Water, 1881. Centigrades.						The Day and the Fishing Station.
		Average.		In the Course of the Week.								
		At Noon.	Lowest Temp.	Highest.	Lowest.	In the Surface.	10 fathoms below Surface.	30 fathoms below Surface.	50 fathoms below Surface.	80 fathoms below Surface.	90 fathoms below Surface.	
January	22	÷7·2	÷ 9·2	÷3·9	÷13·3	1·0	1·25	2·0	5·5	6·25	..	Svolvær, 29th January.
,,	29	÷7·7	÷11·3	0·0	÷13·3	1·0	1·25	1·25	5·5	6·5	..	,, 3rd February.
February	5	÷7·4	÷11·1	÷3·9	÷12 8							
,,	12	÷6·8	÷10·9	÷5·0	÷13·9	0·75	1·0	5·0	5·0	..	..	,, 18th ,,
,,	19	1·2	÷ 3·0	1·7	÷ 5·5	0·0	0·25	5·0	6·0	6·25	6·25	Ostnasfjord, 24th ,,
,,	26	÷1·1	÷ 5·7	1·7	÷11·7							
March	5	÷3·4	÷ 8·4	3·9	÷13·9							
,,	12	0·5	÷ 7·6	3·9	÷ 8·8	0·5	0·50	3·5	5·25	6·0	..	Husvaagen, 11th March.
,,	19	1·5	÷ 2·7	5·0	÷11·7							
,,	26	÷4·8	÷ 9·8	0·6	÷12·8	2·0	3·50	4·25	5·25	..	6·0	Folstad, 24th March.
April	2	÷0·8	÷ 8·0	3·3	÷11·7	2·0	2·5	3·25	4·0	6·0	6·0	,, 28th ,,
,,	9	1·5	÷ 7·0	3·3	÷10·0	2·0	2·25	3·0	3·75	5·0	5·25	Helle, 6th April.
,,	14	5·5	0·4	11·1	÷ 1·1	2·0	3·0	3·25	4·0	5·25	..	Odvar, 8th ,,
Average	.	÷2·2	÷ 7·2									

A still more interesting table showing how very little the "climate" in the deep water changes even when the temperature of the air above changes 27 degrees (on Celsius' thermometer) at the Lofoten Islands, is the following, also taken from the returns 1881 :—

Day.	Temperature of the Air. Centigrades.	The Temperature of the Water at Lödingen. Centigrades.					
		Surface.	10 Fathoms below Surface.	30 Fathoms below Surface.	50 Fathoms below Surface.	70 Fathoms below Surface	100 Fathoms below Surface.
1880							
May 18 . . .	3·3	5·2	4·6	4·2	5·7	6·0	6·4
„ 24 . . .	9·9	6·0	5·2	4·7	5·8	6·0	6·3
June 3 . . .	6·1	5·8	5·4	5·4	4·6	5·2	6·3
„ 10 . . .	11·1	6·5	6·2	5·0	5·7	6·1	6·3
„ 17 . . .	10·3	6·3	6·3	5·0	5·1	6·0	6·3
„ 28 . . .	12·2	8·0	7·3	6·0	5·5	6·0	6·3
July 6 . . .	21·1	9·5	8·8	5·8	6·0	6·3	6·5
„ 16 . . .	9·0	9·0	8·8	6·0	5·2	5·8	6·3
„ 22 . . .	14·4	11·3	10·0	5·8	5·7	6·2	6·5
„ 29 . . .	15·9	10·5	8·3	5·6	5·8	6·2	6·4
August 5 . .	12·5	10·0	8·5	5·4	5·6	6·0	6·4
„ 9 . .	22·1	12·8	11·0	5·6	6·0	6·0	6·4
„ 25 . .	8·7	10·8	11·4	8·8	5·8	6·2	6·4
September 7 .	11·8	10·7	11·0	6·5	6·0	6·2	6·4
„ 14 .	15·9	10·0	10·0	6·8	6·0	6·3	6·4
„ 21 .	15·5	10·8	10·2	6·8	5·8	6·1	6·4
October 7 . .	5·0	8·2	9·2	7·8	6·0	6·0	6·3
„ 25 . .	+2·3	6·8	7·0	8·0	6·7	..	..
„ 29 . .	+5·4	4·9	5·4	8·0	6·8	6·0	6·3
November 16 .	+5·9	3·5	4·3	7·0	6·5	6·2	6·4
„ 25 .	+2·4	3·4	3·8	7·1	6·3	6·2	6·4
„ 30 .	2·1	4·0	4·3	7·1	6·5	..	.
December 13 .	+4·5	3·0	3·1	5·0	6·5	6·1	6·3
„ 23 .	+5·2	2·0	2·0	3·4	6·2	6·2	..
„ 31 .	+2·1	1·5	1·8	5·2	..	..	..
1881							
January 4 . .	+2·3	2·1	2·9	5·8	6·3	6·3	6·3
„ 12 . .	+5·0	2·0	2·5	3·0	4·8	..	..

When the floating eggs of the codfish are carried away by the current to a calm and secure place on the lee-side, they will be hatched under favourable circumstances, and the fry will find an abundance of hiding-places and food along the coast, where seaweed gives shelter and food for a long time. A closer investigation of the "climate" of this part of the Norwegian coast should certainly lead to the conclusion, that a better hatching-place for the eggs and for the development of the fry of the Gadus family scarcely could be found on any coast.

On an average 23 millions of codfish are caught here at Lofoten every winter. The balance of the schools, and also some millions out of the 23 millions left to spawn, is so enormous, that it would be very hard to express by figures how many eggs are deposited. If only 10 millions of female codfish would have the chance to deposit their eggs, each fish would yield at least 1 million of eggs; and if only 1 per cent. of these were hatched out safely every coming spring, there should be codlings enough to form a new stock for an average take of 25 millions of cod for some thousands of years. The reproduction of the cod is extraordinarily great. While a female salmon has 800 to 1000 eggs for each pound of its weight, a cod has more than 100,000 eggs for each pound; and I do not know of any other fish which has so many eggs in proportion to its weight, perhaps with the exception of the Norwegian winter herring, in which I have counted 70,000 per half-pound, or 140,000 eggs a pound.

It has never been proved that the schools of codfish at Lofoten have decreased in the last thousand years, and it would be very hard to prove this, facts leading to a somewhat contrary conclusion. That the schools probably have increased too much, in spite of large takes, may rather be the case, as the codfish sometimes are so meagre and thin, that only want of food in proportion to the enormous schools can account for it. On an average 400 Lofoten codfish will give one barrel of liver, and two barrels of liver will give one barrel of medicinal cod-liver oil. But in seasons when the cod is of poor quality—for instance, last year—900, and even 1200 codfish are required to yield one barrel of liver; and this liver itself is also rather poor, so four barrels instead of two are required to make one barrel of medicinal cod-liver oil.

STATISTICS OF THE LOFOTEN COD FISHERY.

Number of Fishermen and Boats employed, and of Codfish caught, quantities of Liver and Roe produced, in the Lofoten Cod Fishery every year, 1866–1881, *also the Value of the catch, representing the Amount paid to the Fishermen.*

Year.	Number of Fishermen.	Number of Boats.	Catch and Products.			Amount paid to the Fishermen.	Year.
			Codfish.	Liver.	Roe.		
			Number.	Hectolitres.	Hectolitres.	Kroner. 18·2 Kr. =1 Lstlr.	
1866	20,855	5,723	21,000,000	60,320	20,880	5,864,000	1866
1867	21,129	5,906	26,100,000	58,000	19,720	6,168,000	1867
1868	21,088	5,643	24,000,000	48,720	27,840	4,724,000	1868
1869	20,671	5,776	20,400,000	44,080	19,720	4,172,000	1869
1870	18,840	5,030	21,500,000	59,380	23,200	6,480,000	1870
1871	17,420	4,383	17,500,000	49,880	19,140	6,448,000	1871
1872	16,773	4,236	20,000,000	55,680	25,520	7,152,000	1872
1873	17,276	4,275	19,500,000	58,000	20,880	6,220,000	1873
1874	18,821	4,439	20,000,000	46,400	17,400	6,576,000	1874
1875	18,301	4,381	23,000,000	60,320	32,280	6,971,000	1875
1876	21,346	5,790	21,980,000	58,580	23,432	5,682,000	1876
1877	21,287	5,315	28,400,000	78,880	31,320	8,823,000	1877
1878	22,723	5,251	25,270,000	70,180	31,088	6,820,000	1878
1879	25,556	5,609	26,320,000	77,140	31,436	6,435,000	1879
1880	27,232	6,144	27,500,000	81,200	41,992	5,734,000	1880
1881	26,850	6,153	28,400,000	68,092	41,180	5,623,000	1881

Almost at the same time that the Lofoten fishery is carried on, or a little later, cod-fisheries are also carried on at the north-western of Romsdalen every year, and also on the western coast of Bergen, but this is not a large one. These are also fisheries of spawning cod. The fishery on the Söndmöre—a part of Romsdalen—is the largest one, being carried on by eight thousand men, and yielding an average catch of three millions of codfish.

The large cod-fishery of Finmarken, from April to June, is quite a different fishery, it is also a comparatively new trade. Before the commencement of this cod-fishery some spawning codfish are caught; but the main fishery only commences when the caplin has arrived on its spawning grounds, which are on both sides of the North Cape, followed by large schools of cod preying on the caplin. Therefore caplin is used for bait, and is caught only for that purpose on its spawning-grounds. And so far also this fishery is a spawning fishery, that should be expected to be injurious to coming fisheries. Experience has not proved this to be so. Storm and bad weather may interfere, so that the catch will be small, or the schools of cod on their hunting-trips will not find food enough, and be thin and meagre; but the experience of the last forty years, we are told, is that the caplin will return every year—experience of former days is not recorded—and out of the following schools of codfish there will be caught some millions of fish, the quantity differing much more than any other of our cod-fisheries; the average catch may be 15 millions for the whole season, ending late in summer, and including different sizes and ages of codfish.

STATISTICS OF THE "CAPLIN-COD" FISHERY OF FINMARKEN.

Number of Fishermen and Boats employed, number of Codfish caught, and quantities of Liver and Roe produced in the Finmarken (Caplin-) Cod Fishery, each year 1866–1881, *and the Total Value of the mentioned articles, representing the Amount paid the Fishermen.*

Year.	Number of Fishermen.	Number of Boats.	Quantities.			Amount paid the Fishermen or Value.	Year.
			Codfish.	Liver.	Roe.		
			Number.	Hecto-litres.	Hecto-litres.	Kroner. 18·2 Kr. = 1 Lstlr.	
1866	?	?	15,600,000	?	?	2,432,000	1866
1867	11,053	2,806	17,309,000	34,640	?	2,712,000	1867
1868	10,858	2,891	14,946,000	32,662	545	1,852,000	1868
1869	?	?	11,371,000	27,306	522	1,688,000	1869
1870	11,741	3,262	14,607,000	44,057	522	3,032,000	1870
1871	16,536	4,528	13,835,000	49,880	290	3,508,000	1871
1872	16,810	4,679	11,854,000	35,960	464	2,356,000	1872
1873	15,321	4,272	16,834,000	49,184	464	3,528,000	1873
1874	17,051	4,519	17,843,000	50,112	406	3,412,000	1874
1875	16,006	4,462	19,725,000	56,260	360	3,326,000	1875
1876	10,730	3,320	5,228,000	14,229	771	964,000	1876
1877	10,537	3,236	17,643,000	56,346	836	3,650,000	1877
1878	16,429	4,644	12,061,000	37,231	715	2,082,000	1878
1879	17,325	4,902	19,333,000	58,194	718	2,666,000	1879
1880	15,447	4,320	23,626,000	65,588	338	2,690,000	1880
1881	11,736	3,417	12,849,000	34,415	162	2,358,000	1881

The quantities of codfish caught in the spawning season at Lofoten and on the coast of Romsdalen and Finmarken, also that caught in the Caplin Cod Fishery, are stated above, and besides these fisheries other, and comparatively smaller cod fisheries, are carried on later in the year on various parts of the coast, making the whole catch of codfish, and the amount paid to the fisherman for it, to reach the following figures :

The yearly catch of Cod in the "Great Cod Fisheries."

Year.	Number of Cod caught.	Amount paid the Fishermen.
		Kronen. 18·2 Kr. = 1 Lstlr.
1866	44,546,000	11,016,000
1867	51,513,000	11,552,000
1868	47,197,000	8,624,000
1869	41,902,000	8,428,000
1870	49,345,000	13,980,000
1871	40,782,000	13,384,000
1872	47,011,000	14,884,000
1873	49,968,000	15,276,000
1874	47,687,000	14,656,000
1875	57,788,000	15,405,000
1876	40,101,000	10,864,000
1877	66,805,000	19,411,000
1878	50,833,000	12,933,000
1879	63,494,000	13,682,000
1880	68,273,000	12,540,000
1881	55,153,000	10,925,000

THE HERRING FISHERIES.

With regard to the herring fisheries, they can also be traced several hundred years back, the main fishery being, until 13 years ago, the fishing of the winter herring, or the spawning herring, that yielded an average of 800,000 barrels, or 300 millions of fish spawning and spent. The season of this fishery commenced year after year almost on the same day on the same station, and was pretty steady. The "mountain of herring," as the fishermen called it, lifted itself up from the deep basin, and took the old route to the spawning grounds, passing on the road certain stations in a certain week, where the fishermen would wait for it. In the course of years there was some little change in time and place, but not much. The season ended generally in March, the spawning of the herring was the signal: the sea for long distances appeared white from the spawn, and the herring went back to the deep basins. From 1809 until the year 1870 this fishery was carried on, and gave an average of about 800,000 barrels, 1866-1869 the average was 775,000. But in the year 1870 commenced a remarkable diminution; the year 1871 gave about 100,000, in 1874 20,000 barrels, and in 1875 nothing caught, and since, the takes have been 10,000 to 70,000 barrels.

This fishing of spawning herring has been ruined; the cause is unknown. We see the Scotch and Dutch fisheries of spawning herring are still going on and increasing. Perhaps the yearly disturbance in the spawning time has had some effect on the Norwegian grounds; or perhaps the offal and dead herrings on the bottom of the sea have fouled the grounds, so the adhesive herring eggs could not find sound and healthy places; or, perhaps, the food of the herring has been too scarce to attract the schools and keep them in the old localities; or perhaps something else is the cause of the discontinuation of the winter herring fishery; or, perhaps, the herring schools still come to the same localities but farther out, in some distance from the coast, deeper in the water, so nothing can be seen. When the old winter herring fishery was fast decreasing, another winter herring fishery sprung up, and was carried on from 1868 till 1874 in quite another part of the coast; and, what is remarkable, this herring was of the largest size, and had scarcely any spawn, and did not come to spawn. Meanwhile there is another fact we notice now every year, and that is, that the catch of the fat herring late in the summer and fall has increased, and increased so much that the total herring fishery now is larger than at any time before; and, what is still more remarkable, this fat herring fishery of about 700,000 barrels a year gives a much better product than the other herring. The Norwegian fat herring is considered to be the very best herring in the world, and fetches higher prices than any other; it is a maiden herring in its best condition of fineness and flavour. We do not know of any other similar large fishery of maiden herring or "matjes."

One herring fishery has been ruined, and we have got another much better in its place. The spawning herring was only to be found in limited localities; the fat herring is to be found all along the western coast. And when our fishermen have commenced to be more familiar with the new fishery and new methods, I think Norway again will be able, as it was before, to export more herring than any other country in Europe.

STATISTICS OF THE HERRING FISHERIES.

The official reports on the fisheries give the following tables, published by the Cental Office of Statistics of Norway:

Quantities and Values of the catch of Winter-herring and "Large-herring," in the Fisheries of the years 1866–1881.

Year.	Winter-herring.		"Large" or North-herring.	
	Quantities.	Values.	Quantities.	Values.
	Hectolitres.	Kroner. 18·2 Kr. = 1 Lstlr.	Kroner.	Kroner. 18·2 Kr. = 1 Lstlr.
1866	1,042,000	6,264,000	74,000	244,000
1867	737,000	5,304,000	69,000	268,000
1868	834,000	6,632,000	446,000	1,452,000
1869	945,000	3,720,000	388,000	908,000
1870	431,000	1,788,000	268,000	1,412,000
1871	129,000	1,200,000	1,058,000	4,992,000
1872	271,000	1,224,000	232,000	1,336,000
1873	111,000	1,020,000	448,000	2,432,000
1874	24,000	288,000	382,000	1,952,000
1875	208	25,000	..	..
1876	11,000	156,000	..	..
1877	36,000	339,000	..	..
1878	37,000	417,000	..	..
1879	89,000	785,000	..	..
1880	61,000	861,000	..	..
1881	85,000	884,000	..	..

The statistics of the fat-herring or summer herring are not so complete as that of the winter herring; but taking the export as a rule, we find the annual catch of summer herring has never been so large as after the winter herring fishery discontinued:

Quantities and Values of Summer Herring and Sprat Fisheries, before and after the Crisis in the Winter Herring Fishery.

Year	Quantities.	Amount paid the Fishermen.
	Hectolitres.	Kroner. 18·2 Kr. = £1.
1866	203,000	1,012,000
1867	347,000	2,404,000
1868	249,000	1,248,000
1869	549,000	3,324,000
1870	284,000	1,276,000
1872	481,000	2,508,000
1874	809,000	3,652,000
1876	1,011,000	7,814,000

Number of Fishermen and Boats employed in the Summer-herring Fisheries in the years 1876–1881.

Year.	Number of Boats with Gill-nets.	Number of Bands with Seines or Sweep-nets.	Number of Fishermen.		
			With Gill-nets.	With Seines or Sweep-nets.	Total.
1876	12,463	1,862	25,015	23,816	48,831
1877	7,279	1,660	17,698	24,330	42,028
1878	6,001	1,238	14,214	17,245	31,459
1879	5,316	1,462	12,922	19,554	32,476
1880	6,443	1,258	17,261	17,869	35,130
1881	5·970	1,084	17,134	15,200	32,334

Quantities and Values of the catch of Summer-herring and Sprat in the Fisheries of the years 1876–1881.

Summer-herring.

Year.	Quantities.	Amount paid the Fishermen, or Value of the Catch.
	Hectolitres.	Kroner. 18·2 Kr. = 1 Lstlr.
1876	859,000	7,481,000
1877	826,000	5,881,000
1878	675,000	4,043,000
1879	443,000	3,874,000
1880	720,000	5,726,000
1881	605,000	3,765,000

Sprat.

Year.	Quantities.	Amount paid to the Fishermen.
	Hectoliter.	Kroner. 18·2 Kr. = 1 Lstlr.
1876	152,000	333,000
1877	250,000	570,000
1878	138,000	326,000
1879	130,000	261,060
1880	212,000	516,000
1881	187,000	313,000

Quantities and Values of all Herring and Sprat Fisheries in the years 1866–1881.

Year.	Quantities.	Value, or Amount paid to the Fishermen.
	Hectolitres.	Kroner. 18·2 Kr. = 1 Lstlr.
1866	1,319,000	7,520,000
1867	1,153,000	7,976,000
1868	1,529,000	9,332,000
1869	1,882,000	7,952,000
1870	983,000	4,476,000
1871	1,830,000	9,220,000
1872	984,000	5,068,000
1873	954,000	6,388,006
1874	1,215,000	5,892,000
1875	1,269,000	5,658,000
1876	1,022,000	7,970,000
1877	1,112,000	6,790,000
1878	850,000	4,786,000
1879	662,000	4,920,000
1880	993,000	7,103,000
1881	877,000	4,962,000

THE OTHER FISHERIES.

With regard to our other fisheries, there is not much to say here. The mackerel fishery shows a little change; the fleet with drift-nets goes further out in the ocean, uses more nets, and higher prices are obtained in the English markets than before, when the mackerel was caught in smaller quantities, and was taken by hook and line. In the last years (1866-1881) the average catch has been

6·4 millions, paid with about £40,000 to the fishermen yearly.

Our salmon fishery has decreased. The high prices in the English markets are said to have had the effect of increasing the bagnets on the Norwegian coast, and in that way disturbed the salmon on its way to the rivers. I do not think we shall be able to develope our salmon fishery until we adopt the British system of protecting the spawning fish, assisted by means of hatching on a larger scale, and by more salmon ladders, and better or more effective laws. You may compare the salmon fishery in the rivers with a poultry yard; you may be able to control every fish passing up or down the rivers, and kill every one if you like. The market price of salmon in Norway is, at present, higher than the market price in London, and instead of sending the salmon in ice to England, we may now better send technical men to England, Scotland, and Ireland to study how a salmon fishery should be developed. If we succeed in this way, I hope we in an early future again shall have the pleasure to send you our salmon at a low price. In 1876 there were taken 412 tons of salmon and trout, and in 1879 338 tons were taken, but in 1881 367 tons, for which was paid an average amount of £22,000 a year.

Our lobster fishery is still good; we have close time, and a minimum size for marketable lobster. At an average we catch eleven millions of lobsters, and pay the fishermen a little over £19,000 a year for them. We are, however, on a look-out for a decreasing fishery. We have tried to hatch and cultivate the lobster, but have not succeeded, having not been able to keep the hatched young ones alive more than a few days; then all of them disappear, leaving no trace to tell how or why they disappeared. We are told nobody else has succeeded, nor has anybody been able to give a full and satisfactory explanation of the case. Science must here assist, and, as H.R.H. the Duke of Edinburgh, in his excellent paper, told us, the Norwegian lobster was the very best in flavour, I think science in England may first be called upon to assist here in protecting and developing the favourite lobster for the English table. We should feel very much obliged for such valuable assistance, and should not hesitate to take the advice.

Lastly, I shall make a brief remark about our oyster fishery. Twenty or twenty-five years ago we had plenty of oysters, everyone could get a bucket full for sixpence. At present the price is two guineas for a barrel of oysters, and we have no oysters, or scarcely any. Our oyster banks have been ruined by overfishing and carelessness, and give now altogether no more than three or four hundred pounds sterling a year to the fishermen. We have tried pretty hard to assist nature, but commenced too late and have not succeeded. A couple of warm water basins, in which oysters may grow, almost like flowers in a hot house, have been discovered on our coast; spat from these oyster hot houses may be planted out on natural banks, and grow to marketable oysters, but we have not yet experience enough, and it seems to me that the French and English systems will not quite answer our coast without some important alterations.

VALUE AND EXPORT.

Resuming the statistical notes about the beforementioned "great" fisheries on the Norwegian coast, you will find in the following tables how much they all have given

THE QUANTITIES OF FISH

Year.	Codfish.		Herring.		Other Sea Fish, Pickled.	Sprat, Pickled.	Ma and Fres Sa exc	Year.
	Salted. (Klipfish).	Dried (Stockfish).	Pickled.	Smoked.				
	Kilog.	Kilog.	Hectol.	Kilog.	Hectol.	Hectol.	K	
1866	25,727,300	12,416,800	888,998	..	64,841	802	3,05	1866
1867	27,569,300	15,484,800	869,181	..	41,448	968	3,84	1867
1868	28,494,350	14,871,050	906,579	..	52,870	1,300	2,38	1868
1869	23,701,000	17,715,900	1,277,361	..	48,682	1,427	3,09	1869
1870	24,834,400	19,035,700	1,081,684	..	66,758	1,284	3,23	1870
1871	25,135,700	15,847,000	733,017	24,550	70,044	1,580	3,58	1871
1872	30,982,200	17,514,050	1,445,814	258,950	75,966	2,330	3,50	1872
1873	27,974,000	18,397,900	892,445	209,050	81,767	2,577	3,33	1873
1874	29,978,800	19,272,900	1,087,295	355,800	80,532	3,605	2,38	1874
1875	36,826,800	20,865,950	1,037,824	89,850	94,811	2,443	1,97	1875
1876	33,038,050	19,683,700	1,041,645	248,450	106,056	5,983	1,47	1876
1877	45,870,050	21,159,650	795,298	27,450	109,679	4,564	1,19	1877
1878	40,961,050	16,025,550	785,321	111,850	71,507	7,181	1,83	1878
1879	44,684,160	20,655,420	730,945	154,197	99,904	7,420	2,27	1879
1880	52,962,300	19,252,490	536,333	115,691	118,348	11,755	2,21	1880
1881	41,918,720	18,876,200	1,090,623	354,109	167,275	15,574	1,97	1881

THE VALUE* OF T

Year.	Codfish.		Herring.		Other Sea Fish, Pickled.	Sprat, Pickled.	F	Year.
	Salted. (Klipfish).	Dried. (Stockfish).	Pickled.	Smoked.				
	Kroner.	Kroner.	Kroner.	Kroner.	Kroner.	Kroner.		
1866	8,232,736	3,123,532	12,685,304	..	232,452	53,868	76	1866
1867	6,837,188	3,532,224	12,809,936	..	283,340	65,052	52	1867
1868	6,838,644	3,284,772	12,422,244	..	274,748	87,340	04	1868
1869	7,773,928	5,593,964	13,903,028	..	363,976	111,824	84	1869
1870	8,614,276	5,267,156	16,405,052	..	508,212	100,960	80	1870
1871	8,391,200	5,840,000	11,368,400	7,400	505,200	124,000	00	1871
1872	9,420,000	5,646,800	17,750,800	51,600	598,400	162,000	84	1872
1873	9,550,800	6,034,000	15,626,800	50,000	786,400	185,600	00	1873
1874	10,757,200	6,114,800	17,631,200	99,600	672,000	237,200	00	1874
1875	11,958,400	6,540,800	17,176,800	25,200	935,200	163,600	00	1875
1876	13,849,200	7,048,100	19,193,600	79,500	1,061,500	427,000	00	1876
1877	14,365,000	7,275,100	13,503,500	8,800	1,000,000	265,700	00	1877
1878	14,541,300	4,918,800	10,047,900	35,800	597,100	350,300	00	1878
1879	12,282,100	5,533,700	12,282,100	49,300	809,300	423,800	00	1879
1880	12,304,500	5,274,200	9,504,200	37,000	805,900	704,100	00	1880
1881	16,012,000	6,134,800	16,280,300	113,300	1,574,200	734,500	00	1881

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each year (1866-1881) to the fishermen as payment for the catch:

The Great Fisheries in 1866–1881.

Year.	Codfish.	Herring and Sprat.	Mackerel.	The Summer Fisheries of Coal-fish, Ling, etc.	Salmon and Trout.	Lobster.	Total.
	Kroner.	Kroner.	Kroner.	Kroner.	Kroner.	Kroner.	Kroner.
1866	11,016,000	7,520,000	628,000	960,000	252,000	280,000	20,656,000
1867	11,552,000	7,976,000	792,000	980,000	236,000	256,000	21,792,000
1868	8,624,000	9,332,000	580,000	1,100,000	180,000	264,000	20,080,000
1869	8,428,000	7,952,000	600,000	1,168,000	256,000	240,000	18,644,000
1870	13,980,000	4,476,000	684,000	1,204,000	232,000	240,000	20,816,000
1871	13,384,000	9,220,000	900,000	1,360,000	220,000	220,000	25,304,000
1872	14,884,000	5,068,000	716,000	1,396,000	240,000	252,000	22,556,000
1873	15,276,000	6,388,000	832,000	1,748,000	408,000	252,000	24,904,000
1874	14,656,000	5,892,000	796,000	1,328,000	352,000	296,000	23,320,000
1875	15,405,600	5,658,000	719,000	1,270,000	407,000	337,000	23,796,000
1876	10,864,000	7,970,000	621,000	2,000,000	458,000	355,000	22,268,000
1877	19,411,000	6,790,000	703,000	1,790,000	449,000	291,000	29,434,000
1878	12,933,600	4,786,000	671,000	1,977,000	362,000	315,000	21,044,000
1879	13,682,000	4,920,000	681,000	1,371,000	336,000	342,000	21,332,000
1880	12,540,000	7,103,000	696,000	1,448,000	382,000	405,000	22,574,000
1881	10,925,000	4,962,000	769,000	2,175,000	401,000	377,000	19,609,000

As almost the whole catch put in the market for export is cured in some way or other, the statistics of the export, as shown on attached Table, contain the fish or fish products under the names of the goods prepared, with the exception of a few articles exported as fresh fish.

It is a singularity of the export or consumption of cured fish that it has always the special and main market in one or two countries, while the balance of the fish-consuming countries does not at all care for it. To show the character of the Norwegian export in this respect, I will give the "special" export of some important articles, compared with the whole export of the same, in the year 1881.

Norway's Export.		The main Market and its Import from Norway.
Exported Goods.	The whole quantity.	
Codfish (klipfisk)	41,918,720 kilog.	30,361,910 kilog. to Spain.
Dried cod (stokfisk)	18,876,200 „	7,879,780 „ „ Italy and Austria.
Herrings, pickled	1,090,623 hectl.	372,259 hectl. „ Germany.
Sprats „	15,574 „	12,292 „ „ Sweden.
Mackerel, &c., fresh	1,976,100 kilog.	1,860,900 kilog. „ Great Britain.
Salmon, fresh .	379,670 „	280,780 „ „ „ „
Other salt-water fish pickled	167,275 „	166,937 „ „ Russia and Finland.
Lobsters alive .	1,001,981 pieces	515,177 pieces „ Great Britain.
Fish oil . . .	124,916 hectl.	52,765 hectl. „ Germany.
Cod roe . . .	52,750 „	46,631 „ „ France.
Fish guano . .	8,344,550 kilog.	4,738,810 kilog. „ Germany.

After this you will understand that with regard to cod and herring we have an abundance of fish close to our coast at certain times of the year, and we are able to supply the world with large quantities, and do really do it, as has been seen from the tables above; but as we catch the fish either in the dark winter time, or in long distances from the European markets, and in very large quantities at a time—taking cod by the millions and herring by the hundred millions in a few weeks—we are not able at present to export the fish fresh. We are compelled to dry or cure almost all our cod and herring. It would not pay our fishermen to fish much in summer, or for the fresh fish markets. But I hope improvements will come. This exhibition may give us some important advice in respect of fishing more and fishing cheaper, but what we are more interested in are two things. In the first place we wish to know how to bring the fish fresh or in ice to your markets for a low price all the year round. Not every kind of fish will stand a long transport on ice, or in frozen condition; it would be a great benefit to the fishermen as well as to the fishmongers to know how to manage this without injuring the fish neither when on ice nor by thawing it. In the second place we want to know how the reception of such fish should be arranged in a more convenient way. We do not think that the Norwegian fish should expect to be especially welcomed at the gates of your fish markets—Billingsgate and other gates—we only wish to know if some arrangements could not be made to keep the fish fresh for some time, to diminish the great risk that exporting fresh fish to the English markets now runs. We feel sure that, for instance, by arranging refrigerator-warehouses, the effect would be that the markets would not be overstocked and lots of fish spoiled whenever a few extra fish-carriers arrived. Prices would rule more steady, the risk of exporting fish to England would be very trifling, and the supply get very large and very cheap. As it is now, fish will never be a cheap food for the poor in large cities, never; the large amount of spoiled fish must be paid by those who buy the good fish. On the English side of the North Sea arrangements must be made to get the benefit of the abundance of cheap and good fish on the Norwegian coast. One thing could easily be done at once. You could introduce that kind of cured Norwegian fish we now ship to South Europe, South America, and even to China. If the English cooks knew how to make a delicious dish out of a Norwegian stock-fish, you would be able to have a fish dinner for a whole family of five persons for less than a penny a piece paid for the fish. Norway exports at present dried, salted, and pickled fish amounting to a quantity that represents 600,000 tons of fish alive. Almost all this fish is made into food for the poor classes in various countries of the world, and it is a pity that such cheap food does not suit the English taste or the English stomach. The Italian and Spanish way of cooking cured codfish is considered to be a very good one, and to give the English cooks a chance to try the same, I shall in an appendix to this paper (page 29) present to you some recipes worth a trial.

THE CHEAPNESS OF NORWEGIAN FISH.

There is no doubt that the Norwegian fisheries, now yielding about 600,000 tons of fish average a year, would be able to give one million tons if the people abroad were prepared to receive and the Norwegian fishermen in consequence prepared to catch fish at other times of the year than in winter and the spawning season. England would for us be the first, best, and nearest market we should try, and it may already now be of some interest for you to know the average prices on the Norwegian coast at present for some kinds of fish you could have in the London market in less time than forty-eight hours after the fish was caught:

10 to 12 pounds codfish would cost . .	4*d*. to 6*d*.	each.
10 to 12 pounds coalfish	3*d*. ,, 5*d*.	,,
50 pounds halibut.	10*s*.	,,
Cusk, large ones	6*d*.	,,
Haddock, middlings	2*d*.	,,
Pollock ,, ...	2½*d*.	,,
Skate	1*s*.	,,
Red mullet or Rosefish	2*d*.	,,
Ling, large ones	2*s*.	,,
Herrings very often	2*s*. or 3*s*.	for 200 lbs.

The prices quoted above are for fresh fish a piece, taken from the fishermen's boat or delivered there. They are, as you see, low indeed, much lower than the poorer classes in Spain and Portugal, in Italy and Austria, in Germany and Sweden, in Russia and Belgium, pay for the cured Norwegian fish when delivered in the Norwegian harbours for export. There is good reason to say that those prices are so low that they would leave the English fishmongers a good profit after shipping expenses, freight, and refrigerator-warehouse expenses are paid, even if the fish was sold in the English markets at a considerably lower price. Nay, the general public in England would in this way get a chance to have good fresh fish from Norway at a lower price than the poor classes in other countries now pay for the same kind of fish salted, dried, or pickled. The English public would get the fish in a more nutritious form and cheaper.

To what amount expenses by curing and packing the fish are swelled up, you may judge from the following table showing the amount paid to the fishermen, and the amount representing the value of the exported, cured fish products for the same year :

Year.	Amount paid the Fishermen 18·2 Kr. = £1 sterling.	Amount representing the Value of the Export 18·2 Kr. = £1 sterling.
	Kroner.	Kroner.
1872	22,556,000	43,502,500
1873	24,904,000	42,948,800
1874	23,320,000	44,968,800
1875	23,796,000	46,901,600
1876	22,268,000	51,729,100
1877	29,434,000	47,273,800
1878	21,044,000	40,682,500
1879	21,332,000	40,859,500
1880	22,574,000	39,076,300
1881	19,609,000	50,866,100
Average .	23,083,700	44,880,900

As the fish is not exported the same year it is caught and cured, and as the export of fish products to a small extent includes some branches that are not accounted for in the amount paid the fishermen, the expenses of curing and packing the fish and fish products are not shown quite adequate by the difference between the two amounts.

At present Norway does not furnish the English public with fish to any large extent, but I am happy to say that what you get is some of the very best kind of fish in the very best form. You get our salmon, mackerel, and lobster fresh or alive. Our whole export of fish to the English consumers is surprisingly small, and I cannot account for this in any way but this, that the fish trade has not yet arrived to what it ought to be, and that the English fishmongers have not sufficient knowledge of the great supply of cheap fish that could be had from Norway. For the public interested in the matter it must be of great importance to know how large an amount of fish and fish products Norway exports, and how limited the amount exported to Great Britain and Ireland really is. The following statistical tables will show it, giving the weight of and value of all different fish products, exported in 1881, as well as all to Great Britain and Ireland alone.

Goods Exported in 1881.

	The whole Export.		To Great Britain and Ireland.
	Weight Net in Kilogrammes. 100. kilogs. = 1 Ton.	Value in Kroner. 18·2 K. = £1 sterling.	Value in Kroner. 18·2 K. = £1 sterling.
Salmon, fresh and iced	379,670	569,500	421,200
Mackerel, „ „	1,829,210	365,800	386,300
Other kinds of fish, fresh and iced	146,890	52,900	
Stockfish—			
Dried and split fish	1,770,810	717,300	175,600
Coalfish	3,377,520	675,500	
Dried and round fish	13,597,960	4,707,900	
Other kinds of stokfish	129,910	34,100	
Dry salted codfish, &c. (klipfisk)	41,918,720	16,012,000	1,980,900
Salted herrings—			
Spring or winter herring	4,956,524	835,700	32,900
"Large" herring	360,254	75,400	763,400
New or mixed herring	139,750	16,300	
Fat or summer herring	71,591,388	13,485,800	
Sprat	6,728,554	469,400	
Iceland herring	9,740,790	1,359,200	
Other kinds of herring	276,318	38,500	
Salted fish, not referred to above—			
In barrels and kegs	1,410,830	184,100	1,500
In vessels	14,032,660	1,390,100	
Anchovies	1,308,216	734,500	
Smoked salmon	2,980	6,000	
Smoked herring	354,109	113,300	
Lobster	500,990	400,800	206,100
Oysters	6,800	6,800	
Shell fish	40,000	1,600	
Fish meal	1,108	400	
Skin of polar bears	176	600	
„ seals	229,031	301,200	243,900
„ walrus	37,300	11,200	10,100
„ dolphins	18,840	22,600	
Tusk of walrus	665	2,100	
Whalebones	17,120	154,100	145,600
Roe of codfish	6,330,000	1,091,900	
Sounds of fish	21,918	28,500	
Fish guano	8,344,550	1,335,100	422,700
Fat of seals and whales	602,172	252,100	
Spermaceti oil	43,560	24,200	1,411,300
Medicinal cod liver oil—			
Steam refined	882,291	681,700	
Natural	1,164,267	704,200	
Bright cod liver oil	1,839,354	905,100	
Pale brown ditto	2,898,717	1,208,400	
Brown ditto	4,004,952	1,582,400	
Other kinds of fish oil	827,607	356,500	
Footing of fish oil	165,168	12,400	

As you will understand, Norway has, so far as fish supply is concerned, great resources, its coast being a favourite place for the spawning codfish and herring, the fjords and sheltered bays a pleasant nursery for an abundance of fry, and the fishing grounds a large extended meeting place for fish in shoals of inconceivable dimensions. The Norwegian sea, with its deep basins and steady moderate temperature, must be very attractive for the finny tribe, and whatever it is science or practical trade, the learned ichthyologist or the hardy fisherman, who wishes to study the harvest of the sea, in the waters on the other side of the "100 fathom line," and all the conditions on which it depends, or to which it is connected with innumerable ties, the Norwegian coast and sea have afforded resources of the greatest importance. For hundreds of years that part of the North Atlantic seems to have been inexhaustible with regard to the fish supply for a greater part of Europe. Time and trade have changed much since the first century of this traffic, and other countries than Norway may now be said to have taken the lead in the modern fish trade as well as in the fish culture and the science attached to both; but I feel confident that in most of the questions which this Great International Fisheries Exhibition will bring forth, the Norwegian sea, its finny tribe, its vegetation and animal life, will still hold a prominent and important place to all interested in the fisheries or any of their appliances.

APPENDIX.

A.—HOW TO COOK STOCKFISH.

(FRANCO-ITALIAN RECIPES COLLECTED IN ITALY BY MISS H. S.)

The Norwegian Stockfish is a dried fish cured without salt.

Before cooking the fish must be prepared in this way :—Beat it with a wooden club until quite soft and all bones are loose; take out all bones. Soak it for 20 hours, then wash, clean, and dry it carefully.

The Italians prefer meagre fish to plump, and always serve the stockfish with the skin; they also prefer oil, or oil and butter mixed, to butter. The fish is always put on the fire in cold water and taken off before boiling, as boiling makes the stockfish tough. Steaming is still better and makes the fish whiter and softer.

1. *Plain Stewed Stockfish.*

The fish, after being well washed, cleaned, and boned, is put in a pan with butter (and oil mixed) and a little water. Simmer for 45 min. to 1 hour over a slow fire; stir frequently.

2. *Stewed Stockfish.*

Having put the cleaned and boned fish on the fire until about boiling, place butter (and oil) and onions in a stewpan, and when it commences to brown, put in the fish, and cover the pan and the lid with paper. Stew slowly.

3. *Stockfish with Potatoes.*

Put butter (and oil) in a stewpan, make a layer of half-done fish alternate with a layer of slices of potatoes. Simmer very slow.

4. *Stockfish with Motarda.*

Brown light thin slices of onion in butter and oil; put in small pieces of fish with spices and motarda. When the fish commences to brown pour on water, not to cover, and add, if required, until done.

5. *Stockfish with Tomato Sauce.*

Brown chopped parsley and onion in butter and oil (or in oil), put in fresh tomato sauce, and let all cook until about boiling, then put in the fish, whole or in pieces. Stir until done.

6. *Stockfish à la Villageoise.*

Chop a handful of parsley, 6 small onions, 1 eschalot, 2 stalks of celery, and a little lemon peel; brown all in 2 min. with a little butter (or oil) in stewpan. Put in a medium-sized, boned, and cooked stockfish, with salt, pepper, and spices. Cook all for a few minutes, and thin it with 2 glasses of white wine. Simmer 15 min. When ready to serve add the juice of one lemon.

7. *Stockfish au gratin.*

Let the fish come to the boiling point, then take out the bones and cut in pieces. Put in a deep dish 3 oz. of butter, on which place a layer of fish, sprinkle over 2 tablespoonfuls of grated Parmesan cheese, a pinch of salt, add another layer of fish, cheese, etc., until the dish is full. Pour over all ½ glass of white wine, cover with a beaten egg, to which add 2 oz. of butter, cover with grated bread crumbs. Bake all in 35 min. in a slow oven.

8. *Stockfish à la Pauvre Femme.*

Brown in a stewpan, with a little butter and oil (or oil), 4 kernels of shalot until light brown, then add a teaspoonful of flour, and mix all lightly, and add after a while 2 glasses of white wine and 2 glasses of water or broth, a little salt, 2 grains of pepper, and 6 fresh scalded tomatoes (from which skin and seeds are taken out) cut in large square pieces. Put in a middle-sized, half-boiled, and boned stockfish, together with 6 potatoes cut in large square pieces. Cover the stewpan and let it boil for 45 min., season with salt, and serve it very hot.

B.—HOW TO COOK SALTED CODFISH (KLIPFISK).

Good salted codfish should be white and not very thick, and flake nicely when soaked.

Soak it in plenty of water for 30 hours.

1. *Morue à la Lombardie.*

Scald the fish in boiling water, and take out all bones and the skin, cut it in pieces, and put it on the fire in cold water. Having boiled for

2 min., strain off the water and dry the fish, and dredge with flour. Having melted a lump of butter together with slices of an onion and a little chopped parsley until light brown, put the fish in, pour on a little white wine, stir up when boiling slowly. Serve it very hot.

2. *Morue frite.*

Boil the fish, cut it in middle-sized pieces, dip them in Bechamel sauce and let them cool. Having cut the fish in smaller pieces, sprinkle them with bread crumbs, put on beaten eggs, again sprinkle with bread crumbs, and fry. Serve with sauce of fried parsley.

3. *Morue à la Marseillaise.*

Cut two well-soaked, small codfish in four pieces, and put on fire in cold water. When boiling strain off the water, and take out all bones, and skin. Having heated ½ wineglass of olive oil, 2 chopped onions, and a little lemon peel, one minute in a stewpan over the fire, put the still warm fish in and set the pan on hot ashes, mash the fish while adding milk and a little oil until all is well mashed and half firm (as soft butter). Season with salt and spices to taste, add the juice of 2 lemons, a pinch of chopped parsley, a few light-fried truffles or mushrooms. After being well stirred a while, put all in a dish garnished with bread-crust browned in butter, and serve it.